

## Creating Consumption Measures: Hypotheses, Definitions, and Data

In this chapter, we explore why patterns of consumption behavior may differ for farm households relative to all U.S. households. Then, we outline our approach for constructing consistent consumption measures in the Consumer Expenditure (CE) and ARMS survey data.

### Consumption Behavior of Farm Households Versus All U.S. Households

In its simplest form, the permanent income hypothesis (PIH) of consumption and savings behavior posits that the choices made by consumers are determined not by current income but by longer term income expectations.<sup>7</sup> The concept of permanent income is based on the lifetime earning capacity of household real wealth, which includes both physical (real property and financial) and human (education and experience) assets. Measured current income typically contains a permanent component, which is anticipated and planned, and a transitory element, which may be unexpected. The concept of consumption differentiates outlays that result in current enjoyment of goods and services from those that reflect (at least in part) savings for future enjoyment, including the purchase of durable goods such as housing or vehicles, and financial assets such as retirement accounts and insurance.

A major implication of the permanent income hypothesis is that—in the face of current income variability around permanent income—consumers will seek to allocate resources in order to smooth the marginal utility of consumption relative to current income. Household groups with higher shares of transitory income, such as the households of farm operators and other self-employed individuals, are predicted to have lower propensities to consume from current income. Indeed, Friedman (1957) cited this explanation for his finding that the elasticity of consumption with respect to current income was lower for farmers than for nonfarmers.

Whereas 15 years ago the literature interpreted the PIH theory as badly dated, more recent re-formulation of the theory, combined with improved data availability, has reinvigorated this line of research.<sup>8</sup> In recent years, a number of empirical studies have explored predictions from various versions of the permanent income hypothesis. DeJuan and Seater (2006), analyzing CE data, found that the income-elasticity of consumption is lower for households with greater transitory income. Whittaker and Effland (2009), using 2003-05 ARMS data, found that increases in relatively stable nonfarm income have a greater impact on farm household spending than do increases in farm production income, which can vary from year to year because of weather, crop failures, animal losses, and/or commodity price fluctuations.

The theory predicts that the level of income variability is an important driver of the extent of consumption-smoothing behavior. Mishra and Sandretto (2002) document the substantial intertemporal variability of farm household income over the past seven decades, and suggest that variability has not declined during this period.

<sup>7</sup>The permanent income hypothesis is a theory of consumption attributed to Milton Friedman (1957).

<sup>8</sup>A prominent researcher suggested Friedman was more “prescient than primitive” in his 2001 review of the literature on theories of consumption (Carroll, 2001).

Ideally, we would conduct the test of income variability and consumption with panel data. However, lacking panel data capturing the same farm households across multiple years, we test for consumption smoothing across income levels in our cross-sectional data for 2006. The underlying assumption is that greater income dispersion at a point in time is associated with greater intertemporal variability as well, so that current incomes at the low and high ends of the distribution are less likely to be representative of long-term, or “permanent,” income for farm households than for all U.S. households. For example, the operators of large farms, who have the highest average household income but whose farm income is most variable from year to year, are disproportionately represented at both the top and bottom of the income distribution.

We compare how patterns of consumption-smoothing relative to income levels differ between household groups with more and less income variability. We first compare farm households and all U.S. households. In addition, among farm households, we compare households operating farms with annual sales greater than \$100,000 and households operating very small rural-residence farms (with sales less than \$10,000 and a principal operator whose primary occupation is not farming).

## **Creating Consistent Expenditure and Consumption Measures With ARMS and CE Data**

In our analysis, consumption refers to own-household consumption during the current year. The household consumption measure of standard of living—the value of service flows received by the household in the current period—is closely related to living expenses (current expenditures), but differs in key ways, requiring three (sometimes impractical) adjustments:

- The first adjustment is to separate the investment or savings component of expenditures from current consumption. For consumer durables such as housing and vehicles, this can be done by replacing current outlays with the estimated annual flow of consumer services. Also, expenditures that represent savings—such as on disability/life insurance and retirement plans—are excluded from the consumption measure. Some argue that education and health expenditures are more appropriately interpreted as investments and should be excluded, but we do not attempt to do so here.
- A second adjustment is to separate out net expenditures on other households, such as alimony and child support, gifts, and charitable contributions.
- A third adjustment is to capture goods and services consumed without private economic transactions (and therefore without household financial expenditures)—including leisure, public goods, and in-kind transfers (such as Medicare direct payments to health providers).

The categories in the current ARMS living expense (or household expenditure) questions were modeled after the major categories used in the Consumer Expenditure (CE) Survey, the most comprehensive source of expenditure data for U.S. households. Since the ARMS questions were not originally designed to calculate consumption, we adjusted the categories of expenditures in 2006 to isolate pure consumption items. (See Appendix B

for more details of the mapping between CE and ARMS categories and other aspects of the construction of the consumption measures in the two survey data sets.)

The CE survey collects data on over 200 expenditure items, whereas the ARMS survey now collects data on 10 items. Survey research indicates that the estimated value of an aggregate that depends on summing many components varies with the number of components that are measured. The reasoning is that each component is composed of subcomponents, and respondents will not remember all the subcomponents when reporting the value of the component (Weinberg et al., 1999). Thus, increasing the number of components that are queried will tend to increase the aggregate of the components.<sup>9</sup>

By this logic, the ARMS could have a tendency to understate total expenditures. Consequently, we recognize that the ARMS data may be subject to a downward bias, particularly for the aggregated category “all else.” In its official reporting of CE data, BLS does not report a consumption measure. However, a number of researchers have calculated a consumption measure from CE data (Johnson et al., 2005; Meyer and Sullivan, 2003, 2009).

We make parallel adjustments to expenditure data in CE and ARMS in order to calculate consistent consumption measures from the two surveys. The first set of adjustments relates to separating out savings components of expenditures. For the two durable goods, housing and vehicles, we replace expenditures with the value of estimated service flows for shelter and vehicle services. We retain education expenditures (in “all else”) and health expenditures (as a separate item), but drop expenditures on personal insurance and retirement plans in the analysis samples to calculate consumption for both survey samples.

Three categories are treated as disposable goods and services (i.e., their expenditures are included directly in the consumption measure)—food, health care, and all else. And in order to drop contributions to other households from our measure of consumption, we exclude the ARMS expenditure category “charitable contributions and contributions to other households” and the CE category “cash contributions.”<sup>10</sup>

CE and ARMS provide limited opportunities to capture goods and services consumed without private economic transactions—our consumption measure does not include leisure, public goods, or barter. One in-kind transfer captured in the food category for both data sets—at least in concept—is food purchased with food stamps.<sup>11</sup> In addition, ARMS allows us to include for farm households “in-kind farm production for household consumption.”

### ***Calculating Per-Person Equivalence Measures***

Household consumption is subject to economies of scale, where two (or more) people can attain a given standard of living more cheaply in one household than in separate households. To achieve comparability in the per-person standard of living across households of different sizes, we adjust the household income and consumption measures with an equivalence scale. Following Johnson et al. (2005), we use the single-parameter, constant-elasticity equivalence scale, an approach used more frequently in

<sup>9</sup>The ARMS question eliciting the “all else” measure specifically mentions all of the major categories of consumption in the CE survey included in the “all else” category, including entertainment, apparel, household furnishings and equipment, education, child (or adult) care, personal care and services; the only major categories not mentioned are alcohol, tobacco products, and reading, which represented 1.1 percent, 0.7 percent, and 0.3 percent of U.S. household consumption in 2006.

<sup>10</sup>However, we do not reflect in our measure the fact that some purchases may be given to other households as gifts, or that households may receive in-kind gifts.

<sup>11</sup>Meyer, Mok, and Sullivan (2009) document the under-reporting of transfers in the major U.S. economic data sets, including CE.

international comparisons of inequality (Johnson and Shipp, 1999). This particular scale is given by the square root of family size and indicates that the resources for a two-person household must be 41 percent (and not 100 percent) more than those of a single-person household for the two households to have an equivalent standard of living.

## **Data Analysis Samples and Descriptive Statistics**

Table 3 reports descriptive statistics for the five data samples employed in our analysis. For the two main populations, principal farm operator households and all U.S. households, the primary samples are derived from the 2006 ARMS and CE, respectively. We create three additional sub-samples to support within-survey comparisons. Within CE, we pool observations over 3 years (2005-2007) to create a sample of households that report receiving farm income. Within ARMS, we create two farm household subsamples that vary greatly in their exposure to income variability from self-employment—households operating farms with \$100,000 or more in sales and households operating farms with \$10,000 or less in sales, in which the principal operator has a primary occupation other than farming (very small rural-residence farms).

### ***Primary Analysis Samples: All Farm Households (ARMS) and All U.S. Households (CE)***

Detailed expenditure data are only requested on one of the five ARMS questionnaires; consequently, the sample used to analyze consumption data is a subset ( $N = 4,683$ ) of the full 5-questionnaire sample ( $N = 20,342$ ) for 2006. For the consumption analysis, we use CE data (which are collected on a quarterly basis) from 2006. The distributions of demographic and economic variables in the analysis samples used in this section are very similar to those in the larger samples used in the income and wealth analysis (CPS for U.S. households, and the ARMS full sample for farm households), though we highlight below some differences in the income distributions. (See Appendix A for more details on the data sources and the benchmarking of the analysis samples.)

For the CE sample of all U.S. households and the ARMS sample of all farm households, mean values of various demographic and economic characteristics expected to affect the consumption measures are reported in columns 1 and 2 of table 3. Average household size is essentially the same for households of principal farm operators and all U.S. households (2.7 versus 2.5 persons). Not surprisingly, the average age of principal farm operators (57) is greater than for the reference person in CE households (49); however, the average number of farm household members over age 65 is only slightly greater (0.5 versus 0.3 person). Farm operators are much more likely to live in a nonmetro area than all U.S. households (60.6 percent versus 14.6 percent), but have comparable rates of college and post-college education.

Turning to income measures, we observe the familiar pattern of higher household income for farm operator households relative to all U.S. households. However, both analysis samples appear to understate income relative to the larger samples analyzed in table 1. The income distribution for U.S. households is lower in the CE data than the CPS, throughout the distribution

Table 3

**Comparison of characteristics for CE and ARMS samples, 2006**

Source	CE	ARMS	CE	ARMS	ARMS
Years	2006	2006	2005-2007	2006	2006
	All U.S. consumer units	All U.S. principal farm operator households	Farm consumer units	Households of farms with sales of \$100,000 or more	Households of very small rural residence farms
Number of households or consumer units (1,000)	118,843	1,463	1,744	231	503
Sample size	35,832	4,683	1,235	2,538	574
<b>Demographics</b>					
Age of reference person	49	57	55	52	51
Average number of persons in consumer unit:					
Total	2.5	2.7	2.5	3.0	2.9
Children under 18	0.6	0.6	0.5	0.8	0.8
Persons 65 and over	0.3	0.5	0.5	0.2	0.1
Education of reference person:*					
Highest degree completed was:	Percent				
Less than high school	14.9	11.7	13.0	7.3	7.8
High school	26.2	39.2	21.2	39.2	34.6
Some college	21.1	23.1	20.8	27.0	24.4
Associates degree	9.7	na	9.8	na	na
College grad (bachelor's) and beyond	28.0	26.0	35.1	26.5	33.3
Nonmetro residence	14.6	60.6	51.9	69.0	54.8
<b>Economics</b>					
	Dollars				
Income before taxes - mean	60,533	75,080	82,879	108,610	81,930
- median	44,616	55,330	63,132	72,476	67,662
Wages & salaries - mean	48,119	40,222	51,367	23,816	67,179
Self-employment income - mean	3,607	17,024	15,879	72,682	6,502
Net nonfarm business income - mean	3,483	11,294	6,245	9,589	14,748
Net farm income - mean	124	5,730	9,634	63,093	-8,245
	Percent				
Wage income share	79.5	53.6	62.0	21.9	82.0
Self-employment income share	6.0	22.7	19.2	66.9	7.9
Negative household income	0.1	5.9	1.5	13.7	na
	Dollars				
Net worth - mean	na	955,708	na	1,636,325	659,501
- median	na	578,650	na	1,140,075	407,734
	Percent				
Household owns residence	67.0	20.4	92.3	22.6	20.6
Farm owns residence	na	77.1	na	73.8	77.0
	Dollars				
Value of residence - household owned	183,212	192,914	303,066	211,664	211,411
Value of residence - farm owned	na	138,089	na	145,342	140,550

Consumer units from the Consumer Expenditure survey are selected for the farm sample if they reported any farm income (positive or negative).

\*Asked of reference person in the Consumer Expenditure survey, primary operator in Agricultural Resource Management Survey.

na = indicates data are not available or estimate does not comply with disclosure limitation practices.

Very small rural-residence farms: farms where the principal operator indicates his primary occupation is other than farming, and whose farm has sales of \$10,000 or less this year.

Sources: USDA, Economic Research Service using Consumer Expenditure Survey and Agricultural Resource Management Survey, 2006 analysis sample.



(Appendix table A2). The share of total household income from (farm and nonfarm) self-employment received by all households is much higher for farm households (22.7 percent) than for all U.S. households (6.0 percent), as expected.

The CE collects limited information on wealth, but it does report whether the residence is rented or owned by the household and the market value of an owned home. The first critical difference regarding home ownership between the two populations is that three-quarters of farm operator households report they live in a residence owned by the farm. Virtually all of the rest (around 20 percent) report owning their own home, with only 2 percent reporting that they rent their dwelling. In contrast, among all U.S. households, two-thirds report owning their own home and one-third report renting. Market value of homes is comparable across the two groups for households that own their own home. But for those farm households whose home is owned by the farm, the market value of their residence averages 72 percent of homes owned by all U.S. households.

### ***Farm Households (CE)***

Within the CE sample of all U.S. households, we create a farm subsample by selecting any household that reported farm income. To get sufficient sample size, we pool CE observations from 2005 to 2007. The resulting sample size of 1,235 includes repeat observations of the same unit (up to four quarters in total). (In its statistical analysis, BLS treats each quarterly observation as independent.) The CE farm sample scales up to a U.S. population of around 1.7 million farm households, about 15 percent short of the USDA's count of 2.0 million principal farm operators. The deficit becomes 23 percent if one takes into account that the CE sample includes households of secondary operators as well.

Differences in demographic and economic characteristics suggest the CE sample is an imperfect proxy for the farm population, as defined by USDA. Household income averages about 10 percent higher in the CE farm sample than in ARMS. The wage/salary share is higher in the CE sample (62.0 percent versus 53.6 percent), while the self-employment share and share with negative household income are lower.

### ***Diversity Within the Farm Sector: Farms with Sales of \$100,000+ and Very Small Rural-Residence Lifestyle Farms (ARMS)***

We exploit the diversity of the farm sector by comparing two farm household subgroups in ARMS—one that is not much exposed to the risks of self-employment income variability (households operating farms with annual sales of \$10,000 or less, with an operator whose primary occupation is other than farming—very small rural-residence farms) and one that is exposed to such risks (households operating farms with annual sales of \$100,000 or more).

Though very small rural-residence farms represent about 40 percent of U.S. farms, they produce a negligible portion of total sales. On average, farm income in this group is negative (-\$8,245 in 2006). Total household income is a third higher than for all U.S. households, but the shares of income deriving from self-employment income (from farm and nonfarm sources) and from wages and salary are comparable to those of all U.S. households. The share with negative household income cannot be reported due to small sample size, but the estimate is substantially smaller than the overall farm household share (6.0 percent).

In contrast, farms with \$100,000 or more in sales represented 16 percent of farms and produced 89 percent of total sales in 2006. On average, the self-employment share of household income (66.9 percent) is three times that of all farm households, and the share with negative household income (13.7 percent) is more than twice that of the average farm household.